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PLANETARY PHENOMENA FOR SEPTEMBER AND OCTOBER, 1902.

By MALCOLM McNEILL.

SEPTEMBER.

The Sun crosses the celestial equator and the autumnal equinox occurs September 23d, 4 P.M., Pacific time.

Mercury is not favorably situated for naked-eye observation, although it is an evening star and at a considerable distance from the Sun. It reaches greatest east elongation on September 24th, and this elongation (26°) is the greatest east elongation for the year, since it occurs only eleven days after the planet passes its aphelion. But the planet is 10° south of the Sun, and this causes a great shortening of the interval between the setting of the Sun and the planet. The interval is less than one hour throughout the month. On September 20th *Mercury* passes 13′ south of the first magnitude star α *Virginis.*

Venus is still a morning star, but is beginning to approach the Sun quite rapidly, and the interval between rising of the planet and of the Sun shortens from about two hours to about an hour and fifteen minutes. It moves about 35° eastward and southward through the constellation *Leo,* and on September 11th passes south of the first-magnitude star *Regulus,* α *Leonis,* at a distance about equal to the Moon's apparent diameter.

Mars rises about three hours before the Sun; so it can be very easily seen in the early morning, although it has not yet brightened up enough to be at all conspicuous. It moves 19° east and 4° south in the constellation *Cancer.* No bright stars are near it, but it passes between γ and δ *Cancri* on September 15th.

Jupiter is above the horizon until after midnight. It is moving westward, retrograding, about 2° during the month in the constellation *Capricorn.*

Saturn is also in fine position for evening observation. It is in the same constellation as *Jupiter,* and about 17° west of that planet. Its motion is retrograde until September 26th, but is quite small in amount.

Uranus is in the western sky in the evening, and sets at about 9 P.M. at the close of the month. The nearest noticeable star is the third-magnitude θ *Ophiuchi,* 2° east and 2° south of the planet. The planet approaches the star about half a degree during the month.

Neptune rises before midnight soon after September 1st. It is in the western part of the constellation *Gemini.*

OCTOBER.

There will be an eclipse of the Moon on the evening of October 16th. It will be total, and will be visible generally throughout the United States. The totality will last from 9^h 19^m to 10^h 48^m, Pacific time, and the partial phase will begin about an hour before totality and continue an hour after totality is ended.

There will also be a partial eclipse of the Sun, visible only in the Eastern Hemisphere, on October 31st. The maximum obscuration will be about seven tenths of the Sun's diameter.

Mercury is too near the Sun to be seen until the end of the month, and passes inferior conjunction, becoming a morning star, on October 19th. It may be possible during the last few days to see it in the morning twilight, but the conditions are not very good.

Venus, which has been the brightest of the planets in the morning sky for months, is now drawing very close to the Sun and by the end of October rises only about half an hour before sunrise. However, the planet is so much brighter than the others that it may be possible to follow it throughout nearly the entire month.

Mars rises about one minute earlier each day, so that by the end of the month it appears above the horizon at a little after 1 o'clock in the morning. It can not, however, be seen by the naked eye for an hour or more after it rises, since it is still not very bright. It is about one quarter nearer us than it was in May, and consequently about twice as bright. It moves about 17° east and 6° south through *Leo,* and on October 20th it passes about 1° north of the first-magnitude star *Regulus,* α *Leonis.*

Jupiter sets two hours earlier than during September, but is still in fine position for evening observation. Shortly after the beginning of the month it resumes its eastward motion, and by the end of the month it has about the same position among the stars that it held in early September.

Saturn sets about an hour before *Jupiter,* but is still in good position for early evening observation. It also moves eastward about 1° during the month.

Uranus sets quite early in the evening, and is too low down after twilight disappears for easy identification.

Neptune rises late in the evening. It is moving slowly westward in *Gemini.*

SEPTEMBER–OCTOBER, 1902.

PHASES OF THE MOON, P. S. T.

New Moon, . . .	Sept. 1,	9^h	19^m	P. M.
First Quarter, . . .	Sept. 9,	2	15	
Full Moon, . . .	Sept. 17,	10	23	A. M.
Last Quarter, . . .	Sept. 24,	8	31	
New Moon, . . .	Oct. 1,	9	9	
First Quarter, . . .	Oct. 9,	9	21	
Full Moon, . . .	Oct. 16,	10	1	P. M.
Last Quarter, . . .	Oct. 23,	2	58	
New Moon, . . .	Oct. 31,	12	14	A. M.

THE SUN.

1902.	R. A.	Declination.	Rises.	Transits.	Sets.
Sept. 1,	10^h 39^m	+ 8° 32′	5^h 31^m A.M.	Noon	6^h 29^m P.M.
11,	11 15	+ 4 49	5 41	11^h 57^m A.M.	6 13
21,	11 51	+ 0 58	5 50	11 53	5 56
Oct. 1,	12 27	− 2 55	6 0	11 50	5 40
11,	13 4	− 6 46	6 10	11 47	5 24
21,	13 41	− 10 28	6 21	11 45	5 9
31,	14 19	− 13 54	6 32	11 44	4 56

Mercury.

Sept.	1,	11 46	+ 1 54	7 0 A.M.	1 7 P.M.	7 14 P.M.
	11,	12 38	− 5 12	7 37	1 20	7 3
	21,	13 23	−11 15	8 4	1 25	6 46
Oct.	1,	13 56	−15 24	8 12	1 18	6 24
	11,	14 1	−15 44	7 39	12 44	5 49
	21,	13 26	− 9 45	6 3	11 30 A.M.	4 57
	31,	13 14	− 5 51	4 59	10 39	4 19

Venus.

Sept.	1,	9 13	+16 53	3 35 A.M.	10 34 A.M.	5 33 P.M.
	11,	10 1	+13 15	3 57	10 43	5 29
	21,	10 49	+ 8 59	4 20	10 51	5 22
Oct.	1,	11 35	+ 4 18	4 44	10 58	5 12
	11,	12 21	− 0 38	5 5	11 4	5 3
	21,	13 7	− 5 35	5 30	11 11	4 52
	31,	13 53	−10 22	5 54	11 18	4 42

Mars.

Sept.	1,	8 1	+21 29	2 5 A.M.	9 22 A.M.	4 39 P.M.
	11,	8 28	+20 12	1 58	9 10	4 22
	21,	8 53	+18 42	1 50	8 56	4 2
Oct.	1,	9 18	+17 2	1 42	8 41	3 40
	11,	9 42	+15 15	1 33	8 26	3 19
	21,	10 5	+13 21	1 23	8 9	2 55
	31,	10 27	+11 24	1 13	7 52	2 31

Jupiter.

Sept.	1,	20 47	−18 52	5 13 P.M.	10 6 P.M.	2 59 A.M.
Oct.	1,	20 40	−19 18	3 10	8 2	12 54
Nov.	1,	20 45	−18 56	1 12	6 5	10 58 P.M.

Saturn.

Sept.	1,	19 34	−21 51	4 12 P.M.	8 53 P.M.	1 34 A.M.
Oct.	1,	19 32	−21 57	2 13	6 54	11 35 P.M.
Nov.	1,	19 36	−21 49	12 14	4 56	9 38

Uranus.

Sept.	1,	17 5	−22 56	1 48 P.M.	6 25 P.M.	11 2 P.M.
Oct.	1,	17 7	−22 59	11 52 A.M.	4 29	9 6
Nov.	1,	17 12	−23 5	9 55	2 32	7 9

NEPTUNE.

Sept. 1,	6 15	+22 18	12 15 A.M.	7 36 A.M.	2 57 P.M.
Oct. 1,	6 16	+22 17	10 19 P.M.	5 40	1 1
Nov. 1,	6 15	+22 16	8 16	3 37	10 58 A.M.

ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

(Off right-hand limb as seen in an inverting telescope.)

I, R,	Sept.	1,	2^{h}	40^{m}	A.M.
I, R,		2,	9	9	P.M.
II, R,		5,	10	35	
I, R,		9,	11	4	
I, R,		11,	5	32	
II, R,		13,	1	12	A.M.
IV, R,		15,	4	53	P.M.
I, R,		17,	12	59	A.M.
I, R,		18,	7	26	P.M.
II, R,		23,	5	7	
III, R,		24,	4	57	
I, R,		25,	9	23	
I, R,		27,	3	52	
II, D,		30,	7	44	
III, D,	Oct.	1,	5^{h}	25^{m}	P.M.
III, R,		1,	8	58	
I, R,		2,	11	18	
I, R,		4,	5	47	
II, R,		7,	10	22	
III, D,		8,	9	26	
III, R,		9,	12	59	A.M.
I, R,		11,	7	42	P.M.
I, R,		18,	9	38	
I, R,		20,	4	7	
II, R,		25,	4	56	
I, R,		25,	11	33	
I, R,		27,	6	2	

DEFINITIVE DETERMINATION OF THE ORBIT OF COMET 1898 I.

[Abstract of No. 3 of the *Astronomische Abhandlungen.*]

BY HEBER D. CURTIS.

Comet 1898 I was discovered by Professor C. D. PERRINE at Mt. Hamilton on March 19, 1898. At this date it was about equal to a sixth-magnitude star, with a head nearly 2′ in diameter and a broad fan-shaped tail about a degree in length. In all, the comet was observed 666 times at thirty-four observatories. Deducting for incomplete observations, 640 were made in Right Ascension and 639 in Declination. The comet had just passed perihelion (March 17th) and was visible for nine months, during which time it swept over a heliocentric arc of 110°.

The comet presented no unusual phenomena in physical appearance or spectrum, with the exception of a sharp fan-